TSU RM with V.35

RACKMOUNT
T1 DATA SERVICE UNIT
with V.35

USER MANUAL

61200.077L1-1B
June 1997

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FCC regulations require that the following information be provided to the customer in this manual.

1. This equipment complies with Part 68 of the FCC rules. On the rear of the faceplate is a label that contains, among other information, the FCC registration number for this equipment. If requested, provide this information to your telephone company.

2. If your telephone equipment (TSU) causes harm to the telephone network, the Telephone Company may discontinue your service temporarily. If possible, they will notify you in advance. But if advance notice isn't practical, you will be notified as soon as possible. You will be advised of your right to file a complaint with the FCC.

3. Your telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the proper operation of your equipment. If they do, you will be given advance notice so as to give you an opportunity to maintain uninterrupted service.

4. If you experience trouble with this equipment (TSU), please contact ADTRAN (see *Customer Service and Warranty Information* in the inside back cover of this manual) for repair / warranty information. The telephone company may ask you to disconnect this equipment from the network until the problem has been corrected, or until you are sure the equipment is not malfunctioning.

5. This unit contains no user serviceable parts.

6. An FCC compliant telephone cord and modular plug is provide withthis equipment. This equipment is designed to be connected to the telephone network or premises wiring using a compatible modular jack which is Part 68 compliant. See Installation Instructions for details.

7. The following information may be required when applying to your local telephone company for leased line facilities.

Service Type	Digital Facility Interface Code	Service Order Code	Network Jacks
1.544 Mbps Digital Interface SF	04DU9-B	6.0F	RJ48C
1.544 Mbps Digital Interface ESF	04DU9-C	6.0F	RJ48C
1.544 Mbps Digital Interface ESF with B8ZS	04DU9-C	6.0F	RJ48C

FEDERAL COMMUNICATIONS COMMISSION
RADIO FREQUENCY INTERFERENCE STATEMENT:

This equipment has been tested and found to comply with the limits for a Class A digital device, Pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instuction manual, may cause harmful interference to radio frequencies. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Shielded cables must be used with this unit to ensure compliance with Class A FCC limits.

WARNING *Change or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.*

CANADIAN EMISSIONS REQUIREMENTS

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the interfe rence-causing equipment standard entitled "Digital Apparatus", ICES-003 of the Department of Communications.

Cet appareil nuerique respecte les limites de bruits radioelectriques applicables aux appareils numeriques de Class A prescrites dans la norme sur le materiel brouilleur: "Appareils Numeriques," NMB-003 edictee par le ministre des Communications.

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Chapter 1
Introduction

GENERAL DESCRIPTION

The ADTRAN T1 Data Service Unit (TSU) in either the stand alone or the rackmount (RM) version for the Smart 16 shelf provides a reliable, high speed data connection from customer synchronous data terminal equipment (DTE) through T1/FT1 lines.

The TSU serves as the link between user data sources such as LAN bridges and routers, computers, CAD systems, and teleconferencing equipment. The amount of bandwidth allocated to the port is user programmable at Nx56 or Nx64 kbps where N = 1 to 24. The DTE data can occupy contiguous or alternate channels in the T1 stream and the channels may start at any position. The DTE port provides a V.35 electrical and physical interface.

The network interface may be either D4 superframe format (SF) or extended superframe format (ESF) and the line code may be straight AMI or B8ZS. In the case of a fractional connection, the unused channels of the T1 are filled with all 1s idle code.

Chapter 2
Physical Description

The TSU RM is composed of two cards. The first is the TSU main card which has a front panel with eight LED indicators. The second card is the TSU interface card which mounts on the rear of the shelf and contains all the jacks necessary for connection to the network, test jacks, and the DTE connector.

FRONT PANEL

The front panel of the TSU contains eight LED indicators that provide DTE interface, network, and test status. These indicators are shown in Figure 2-1.

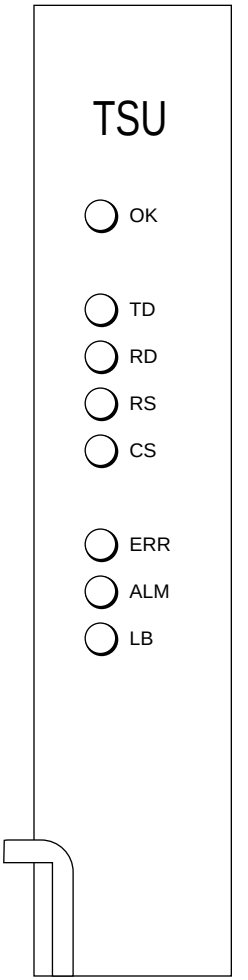

Figure 2-1
TSU Front Panel

OK Status (green)

OK The OK LED indicates the result of the last self test. If all the tests were passed, the LED is *On*.

DTE Status (green)

TD Transmitted data from the DTE

RD Received data from the TSU

RS Request to send from the DTE

CS Clear to send from the TSU

The active state for the status indicators (RS and CS) is On while the on state for the data indicators (TD and RD) represents a change in state from low to high.

Error/Alarm Status (red)

ERR *On* indicates that CRC errors (in ESF), bipolar violations (BPVs), or frame bit errors have occurred within the last second.

ALM *On* indicates that one of the alarm conditions listed in Table 2-A is currently active.

Table 2-A
Alarm Conditions

Alarm	Description
LOS	Loss of signal at NI
AIS	Alarm indicator signal (all 1s) received at NI
OOF	Out of frame at NI
Yellow	Yellow alarm received at NI
PLL Alarm	Phase locked loop alarm (unable to lock on clock source)

Loopback Status (yellow)

LB The LB LED indicates the loopback status of the unit. If the TSU is in line loopback, payload loopback, or DTE loopback, the LB LED is *On*.

REAR PANEL

The TSU rear panel is shown in Figure 2-2. The thirty-four pin connector labeled **DTE V.35** provides the synchronous DTE interface. Connection to the T1/FT1 network is made through the eight-pin modular jack labeled **NET RJ45**. The **NET DB15** may be used instead of the **NET RJ45**. The pin assignments for these connectors are described in *Network and DTE Connections* in the chapter *Installation*. The three test jacks are Bantam connectors that are used when troubleshooting the T1 link. The MON (monitor) jack is resistively isolated from the IN (input) jack and may be used during normal operation of the T1 line. The IN and OUT (output) jacks are intrusive test jacks. When a test connector is plugged into one of these jacks, the corresponding connections on the NET RJ45 jack are bypassed. The IN jack is used to transmit data from a test set into the TSU. The OUT jack is used to transmit data out of the TSU and into a test set.

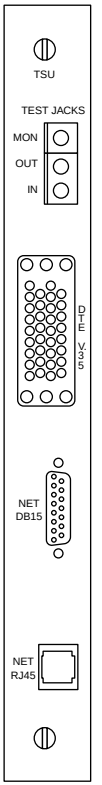

Figure 2-2
TSU Rear Panel

Chapter 3
Installation

UNPACKING

After unpacking the TSU, carefully inspect it for shipping damages. If you suspect damage, immediately file a claim with the carrier and contact ADTRAN Technical Support (see the inside back cover). If possible, keep the original shipping container to return the unit to ADTRAN for repair or verification of shipping damage.

POWERING

The TSU receives power from the SMART 16 shelf. The shelf supplies ±5 VDC and ±12 VDC to the TSU when the unit is in one of the 16 slots.

NETWORK AND DTE CONNECTIONS

Network Connections

The eight-position modular jack labeled **NET RJ45** on the rear of the TSU interface board is used for connection to the network. See Table 3-A for the pinout of this connector.

Connector type = (USOC) RJ-48C

Table 3-A
Network RJ-45 Pinout

Pin	Name	Description
1	R1	RX Data Ring
2	T1	RX Data Tip
3	unused	
4	R	TX Data Ring
5	T	TX Data Tip
6,7,8	unused	

The fifteen pin connector labeled **NET DB15** on the rear of the TSU interface board is an altenate connection to the network. See Table 3-B for the pinout of this connector.

Table 3-B
Network DB-15 Pinout

Pin	Name	Description
1	T	TX Data Tip
2	Frame Ground	
3	T1	RX Data Tip
4	Frame Ground	
5, 6, 7, 8	unused	
9	R	TX Data Ring
10	unused	
11	R1	RX Data Ring
12, 13, 14, 15	unused	

DTE Connections

There is a V.35 connector for connection to the DTE on the rear of the interface board. Table 3-C shows the pinout for this connector.

Connector type = V.35

Table 3-C
V.35 Pinout

Pin	CCITT	Description
A	101	Protective Ground (PG)
B	102	Signal Ground (SG)
C	105	Request to Send (RTS) from DTE
D	106	Clear to Send (CTS) to DTE
E	107	Data Set Ready (DSR) to DTE
F	109	Received Line Signal Detector (DCD) to DTE
J, L	-	Local Loopback (LL) from DTE
N, BB	-	Remote Loopback (RL) from DTE
R	104	Receive Data (RD-A) to DTE
T	104	Receive Data (RD-B) to DTE
V	115	RX Clock (RC-A) to DTE
X	115	RX Clock (RC-B) to DTE
P	103	Transmit Data (TD-A) from DTE
S	103	Transmit Data (TD-B) from DTE
Y	114	TX Clock (TC-A) to DTE
AA	114	TX Clock (TC-B) to DTE
U	113	External TX Clock (ETC-A) from DTE
W	113	External TX Clock (ETC-B) from DTE
K, NN	-	Test Mode (TM) to DTE

Chapter 4
Operation

Configure and control the TSU through the controller card in the SMART 16 shelf. The user has two choices of input/output devices for the controller card.

- An RS-232 port, mounted on the rear of the shelf, provides a VT 100 compatible ASCII terminal interface. A modem can be used for remote applications.

- The ADTRAN DATAMATE, an optional hand-held control unit, provides a 2x16 character LCD display and an 18-position keypad.

MENU STRUCTURES

The TSU uses a hierarchical structure to access its many features from either the DATAMATE or terminal interface on the controller. All of the setup features of the TSU are accessed by first making a choice from the main menus shown in Figures 4-1 and 4-2 and pressing **Enter**.

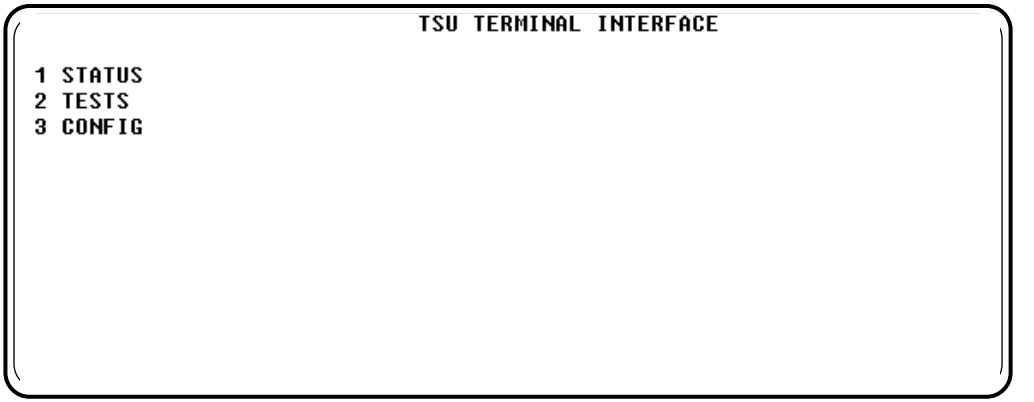

Figure 4-1
Display of Terminal Main Menu

1=STATUS 2=TEST
3=CONFIG

Figure 4-2
Display of DATAMATE Main Menu

CONFIGURATION

The TSU has seven network options and nine DTE options. These options are set from the terminal or DATAMATE interface by selecting the Network or DTE options under Configuration. From the main menu shown in Figure 4-1, select **3** and press **Enter**. The individual options are described following the configuration menus shown in Figures 4-3 and 4-4.

```
                    TSU CONFIGURATION MENU
NETWORK OPTIONS                    DTE/OTHER OPTIONS
 1 FORMAT=ESF                       8 RATE(Nx56/64)=Nx64
 2 LINE CODE=B8ZS                   9 CONT/ALT CHANNELS=CONTIGUOUS
 3 YELLOW ALARM=ENABLED            10 DTE TX CLK=INTERNAL
 4 XMIT PRM=OFF                    11 STARTING CHANNEL=1
 5 CLOCK SOURCE=INTERNAL           12 NUMBER OF CHANNELS=24
 6 BIT STUFFING=DISABLED           13 DATA OPTION=NORMAL
 7 TX LBO=0.0 dB                   14 CTS OPTION=NORMAL
                                   15 DCD OPTION=NORMAL
                                   16 DSR OPTION=NORMAL
                                   17 FACTORY RESTORE
```

Figure 4-3
Display of Terminal Configuration Menu

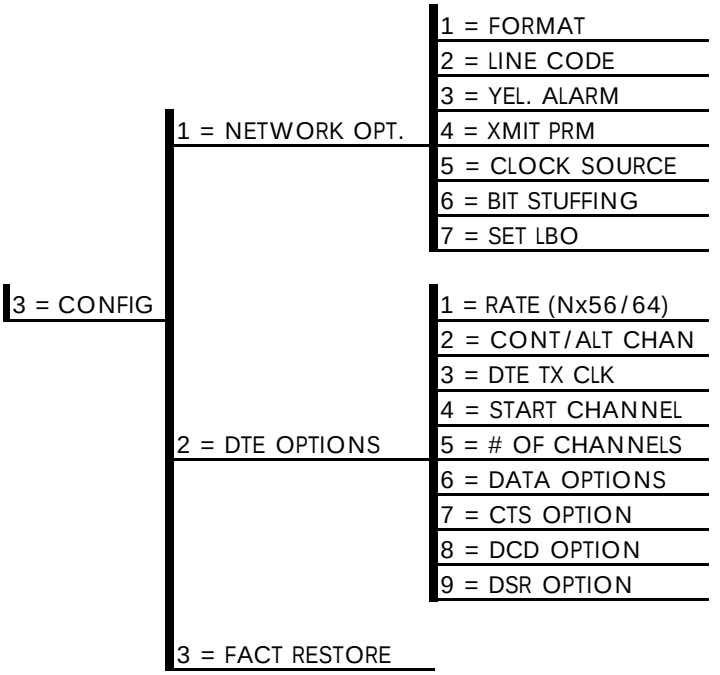
3 = CONFIG
1 = NETWORK OPT.
1 = FORMAT
2 = LINE CODE
3 = YEL. ALARM
4 = XMIT PRM
5 = CLOCK SOURCE
6 = BIT STUFFING
7 = SET LBO
2 = DTE OPTIONS
1 = RATE (Nx56/64)
2 = CONT/ALT CHAN
3 = DTE TX CLK
4 = START CHANNEL
5 = # OF CHANNELS
6 = DATA OPTIONS
7 = CTS OPTION
8 = DCD OPTION
9 = DSR OPTION
3 = FACT RESTORE

Figure 4-4
DATAMATE Configuration Menu Tree

Network Options

Format

This option selects the framing format for the network interface. Superframe format (SF) and extended superframe format (ESF) are the two choices. ESF provides an out-of-band communications channel that allows the carrier to retrieve performance monitoring data and initiate loopbacks in accordance with ANSI T1.403 and AT&T 54016. If on a public network, this setting must be in accordance with the type of service provided by the carrier.

Line Code

This option selects whether the TSU uses straight AMI line coding or B8ZS. B8ZS ensures ones-density requirements on the network by replacing an all 0s byte with a specific byte containing two intentional bipolar violations (BPVs). If on a public network, this setting must be in accordance with the service provided by the carrier.

Yellow Alarm

This option enables or disables the transmission of yellow alarms by the TSU. When the TSU is in red alarm caused by loss of signal / out of frame conditions (LOS / OOF), a pattern may be sent towards the network to alert the carrier / far end of the red alarm. In D4 format, the yellow alarm is sent in-band and thus corrupts the data in the outgoing direction. Some private network applications may require that the yellow alarm transmission be disabled. If using a carrier-provided T1, enable the yellow alarm.

Transmit Performance Report Message

A Transmit Performance Report Message (Xmit PRM) is a status update sent towards the network by the TSU when in ESF mode. This report is sent in accordance with ANSI T1.403 and is a summary of the last four seconds of operation. Enable this option unless told otherwise by the carrier. The PRM is sent when this option is *On*.

Clock Source

A master timing source must be defined for proper operation of the T1 link. If the TSU is connected to a carrier-provided T1 line, the clock source should be set for Network. If the TSU is part of a private network, the user must option one of the TSUs for Network timing and the other to Internal or DTE timing. When optioned for Internal timing, the TSU uses its internal 1.544 MHz clock source. When optioned for DTE, the TSU derives timing from the DTE transmit clock.

Bit Stuffing

Bit stuffing is an option used to ensure pulse density requirements on carrier-provided T1 lines in accordance with ANSI T1.403 and AT&T 62411. If B8ZS is enabled, Nx56 is optioned, alternate channels are being used, or inverted data (HDLC) is used, the N pulse density requirement is already met and bit stuffing should be disabled. If none of the above options are selected, enable bit stuffing.

Bit stuffing corrupts the user data from the DTE when they fail to meet the 12.5% 1s density requirement. If the DTE data do not meet this requirement, enable one of the above options.

Transmit Line Build Out

Transmit Line Build Out (Tx LBO) selects the transmit level of the outgoing T1 stream. Attenuation of the T1 signal can be added to avoid overdriving repeaters on the T1 line. On most carrier- provided T1 lines, a smart jack is installed at the network demarcation point and should receive a 0 dB signal. If there is no smart jack, the auto line build out feature may be deployed. This feature enables the TSU to base its transmit level on the level of the signal received from the network. If trouble exists with the auto line build out feature, try each of the selections until achieving reliable operation.

DTE Options

Rate (Nx56/64)

This selection chooses whether the DTE data rate is Nx56 or Nx64 kbps where N = 1 to 24. N corresponds to the number of channels occupied within the T1/FT1 stream. On Fractional T1 (FT1), the user is billed based on bandwidth (number of channels allocated) so N determines the cost of a circuit. On a private network, the limiting factor for N will be the maximum data rate of the DTE equipment. On a carrier-provided T1 that does not support B8ZS, Nx56 may be chosen to ensure pulse density requirements and eliminate 1s density restrictions on the DTE data. The trade-off is a 1/8 reduction in bandwidth. The alternate channels option discussed below may also be used to meet this requirement; however, the carrier must allow it and the maximum number of channels is 12.

Contiguous/Alternate Channels

As mentioned previously, the TSU may be optioned to use contiguous or alternate channels within the T1 stream. The Alternate Channels option provides another means of meeting pulse density requirements. If the number of channels is no more than 12 and the carrier allows this setting, this option may be the better solution. The alternate channels option means that every other channel within the T1 (from the starting channel position through the ending channel position) is occupied with DTE data. All other channels will have idle code. The Contiguous Channels option means that the DTE data occupy one channel after the other (starting at the programmed channel and using the number of channels chosen).

DTE Transmit (Tx) Clock

The data transmitted from the DTE may be clocked into the TSU using the clock provided by the TSU (Internal), the clock generated by the DTE (External), or an inverted version of the clock provided by the TSU (INT-INV). The last option overcomes propagation delays due to long V.35 cables and the internal circuitry of the DTE.

Starting Channel

The DTE data can occupy the T1 stream starting in any of the 24 channels. For a full T1 link, this value should be one. For a public FT1 link, this value should correspond to the value specified by the carrier.

Number of Channels (N)

The number of channels used within the T1 stream can be set from 1 to 24. The user bandwidth and DTE data rate are determined by Nx56 kbps or Nx64 kbps, depending upon the Rate setting described above.

Data Option

The data option may be set for Normal or Invert. The Invert mode provides another method to meet pulse density requirements. In the Invert mode, data transmitted to or received from the DTE are inverted before being sent downstream. This option is useful for HDLC-style DTE protocols since they restrict the number of consecutive 1s transmitted. Inverting HDLC data restricts the number of consecutive zeros transmitted. The data are sent unaltered in the Normal mode.

CTS Option

This option allows Clear To Send (CTS) to operate normally (Normal) or to be forced *On* all the time (Forced On). This option should be set in accordance with the DTE requirements.

During normal operation CTS usually follows RTS. CTS is *Off* when any of the following conditions exist:

- RTS is not asserted
- TSU is in self test
- TSU is in local loopback
- TSU is sending test pattern
- TSU is receiving yellow alarm in ESF mode.

DCD Option

This option allows Data Carrier Detect (DCD) to operate normally (Normal) or to be forced *On* all the time (Forced On). This option should be set in accordance with the DTE requirements.

During normal operation, DCD, also known as Received Line Signal Detector (RLSD), is *On* when data are being received from the network. DCD is *Off* when either of the following conditions exist:

- Network signal is out of frame
- TSU is sending a test pattern.

DSR Option

This option allows Data Set Ready (DSR) to operate normally (Normal) or to be forced *On* all the time (Forced On). This option should be set in accordance with the DTE requirements.

During normal operation, DSR is *Off* if any of the following conditions exist:

- TSU is in self test
- TSU is in local loopback
- TSU is sending test pattern.

Factory Restore

This selection resets all the configuration options to the factory preset values. These values are listed in Tables 4-A and 4-B.

Table 4-A
Network Factory Defaults

Option	Setting
FORMAT	ESF
LINE CODE	B8ZS
YELLOW ALARM	ENABLES
XMIT PRM	OFF
CLOCK SOURCE	NETWORK
BIT STUFFING	DISABLED
TX LBO	0.0 dB

Table 4-B
DTE Factory Defaults

Option	Setting
RATE (NX56/64)	Nx64
CONT/ALT CHANNELS	CONTIGUOUS
DTE TX CLK	INTERNAL
STARTING CHANNEL	1
NUMBER OF CHANNELS	24
DATA OPTION	NORMAL
CTS OPTION	NORMAL
DCD OPTION	NORMAL
DSR OPTION	NORMAL

TESTS

The test menus initiate different types of tests and allow the user to view test results. The test menu can be accessed by selecting 2 from either the terminal or the DATAMATE. The test menus are shown in Figures 4-5 through 4-8 followed by a description of each test item.

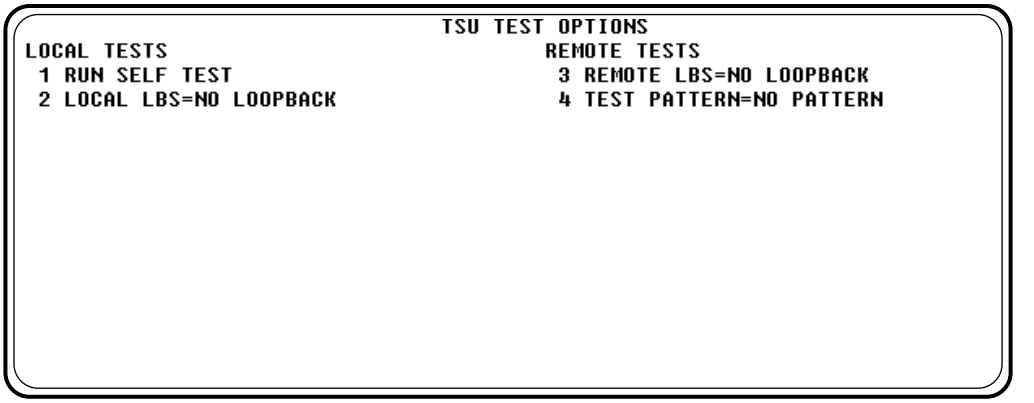

Figure 4-5
Display of Terminal Test Menu

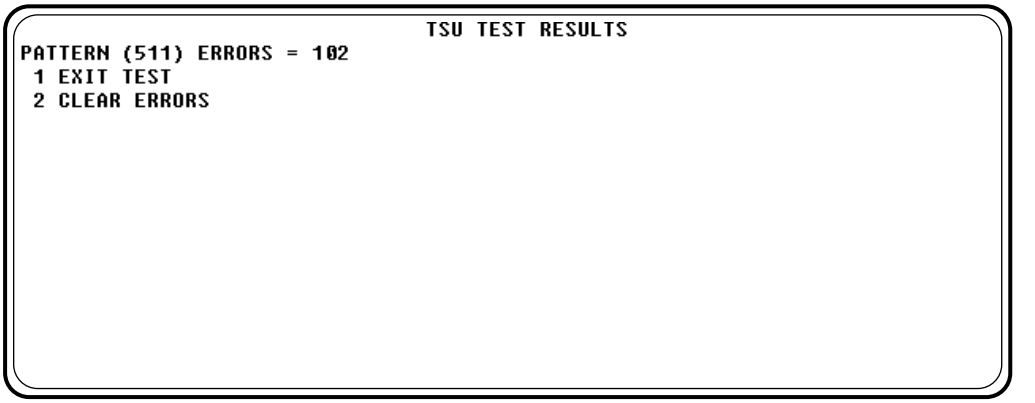

Figure 4-6
Display of Terminal Test Results

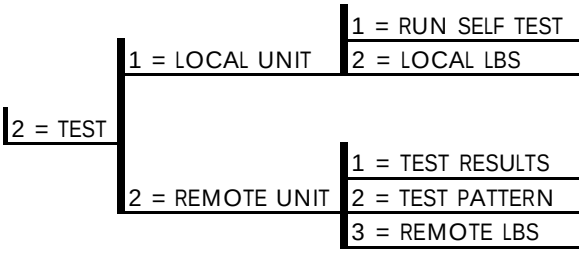

Figure 4-7
DATAMATE Test Menu Tree

```
CODE VIOL TOTAL
0
```

Figure 4-8
DATAMATE Test Results Display Example

Self Test

The TSU has an extensive set of self test functions. When this test is initiated from the terminal, the TSU branches to the status display where the self test results are shown. When this test is initiated from the DATAMATE, the firmware checksum is displayed, followed by the self test result. The LEDs on the front of the TSU scroll during self test.

Local Loopbacks

When the TSU is performing a local loopback, it loops the data received at one of its interfaces back to transmit data for that interface. When in line loopback, every bit received at the network interface is looped back to the network as shown in Figure 4-9.

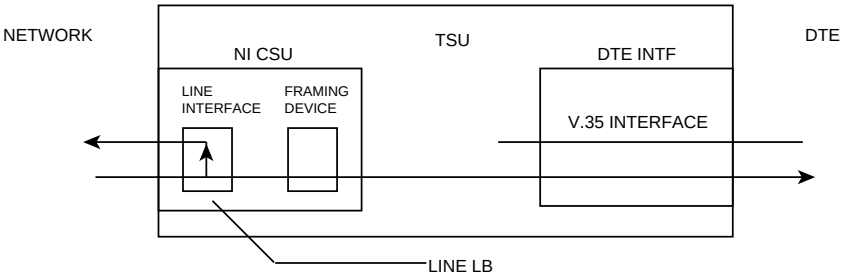

Figure 4-9
Local Line Loopback

For payload loopback, the TSU loops back all the data (payload) bits within the T1 stream, but regenerates the framing bits as shown in Figure 4-10.

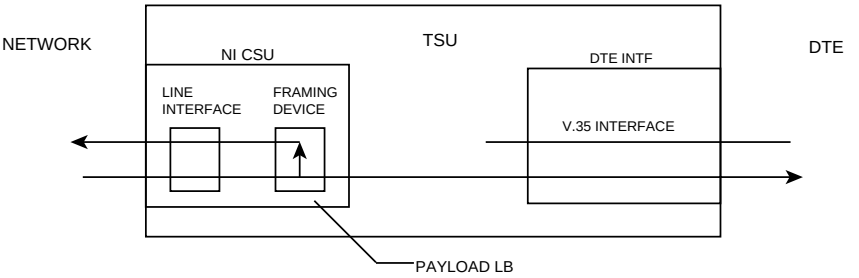

Figure 4-10
Payload Loopback

When in DTE loopback, the TSU loops all the data received at the DTE interface back to the DTE as shown in Figure 4-11.

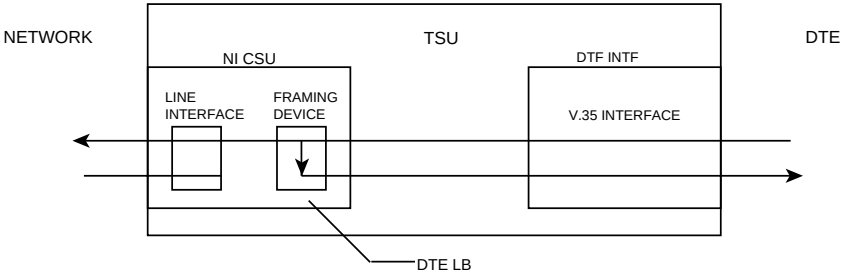

Figure 4-11
Local DTE Loopback

Remote Loopbacks

When a remote loopback is chosen, a code is sent towards the network that is intended to loopback the far end TSU. These loopbacks will be either line (LLB) or payload (PLB) as described in *Local Loopbacks* of this chapter. Some of these codes are sent out-of-band in the ESF Facility Data Link (FDL - 4 kbps control channel) and some are sent in-band. The FDL codes only work when the framing bits are actually transported from one end of the T1 to the other. This type of test is valid for full T1 but may not be for FT1. The AT&T in-band LLB and the V.54 in-band PLB do not use the FDL, but the AT&T code requires a full T1 link. For FT1, it is more reliable to use the V.54 INBAND PLB when the units on both ends support it.

Test Patterns

The TSU can send four different data patterns to the network. These patterns are used for testing the T1 link. The All Ones pattern sends all 1s in every channel of the T1. The 3 in 24 pattern sends a fixed pattern with three 1s and 21 0s. This pattern is used to test pulse density requirements. This pattern also occupies all channels of the T1. The 511 pattern is a pseudo-random data pattern only sent to the channels programmed for the DTE data. The 1 in 8 pattern is similar to the 3 in 24 pattern except that one out of every eight bits is set. When a pattern is started from the terminal, a TSU Test Results screen is displayed. If the 511 pattern is sent, a count of receive errors is displayed. If a 511 pattern is not sent, a code violations (CV) total is displayed. If the pattern is started from the DATAMATE, the error or CV total is found under the Test Results selection. The error and CV totals are cleared when entering the display.

STATUS

The Status menus of the DATAMATE and terminal allow errors and alarms to be viewed and error / alarm histories to be cleared. If an alarm occurs after power up or after the history registers were last cleared, the history registers are set again. Current errors / alarms reflect only the current status. The different errors and alarms were discussed in the *Front Panel* section of the chapter *Physical Description*. The terminal Status menus and the DATAMATE Status tree are shown in Figures 4-12 through 4-15.

```
                              TSU STATUS

 1 CLEAR HISTORY
 2 DISPLAY STATUS
 3 LOCAL PERFORMANCE
 4 REMOTE PERFORMANCE
```

Figure 4-12
Display of Terminal Status Selection Menu

```
                          TSU STATUS DISPLAY
CURRENT ERRORS/ALARMS/RESULTS          HISTORY ERRORS/ALARMS
  Rx LOS = YES                           Rx LOS = YES
  Rx AIS = NO                            Rx AIS = YES
  Rx OOF = YES                           Rx OOF = YES
  Rx Yellow = NO                         Rx Yellow = YES
  Rx Red = YES                           Rx Red = YES
  Rx CVs = NO                            Rx CVs = YES
  Rx BPVs = NO                           Rx BPVs = YES
  Rx FRM ERRs = NO                       Rx FRM ERRs = YES
  PLL Alarm = NO                         PLL Alarm = YES
  SELF TEST = PASS
  SOFTWARE REV = REVISION E
  CHECKSUM = E203
```

Figure 4-13
Terminal Status Display Example

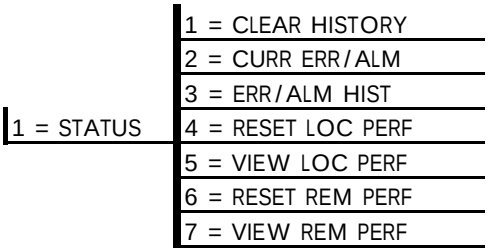

Figure 4-14
DATAMATE Status Menu Tree

```
(* YES,-NO)
NI RX AIS          *
```

Figure 4-15
DATAMATE Status Display Example

In the status displayed in Figure 4-14, NI means network interface and TI means terminal or DTE interface. In the DATAMATE status displayed in Figure 4-15, the first line indicates that an asterisk (*) means Yes, and a dash (-) means No. The second line lists the applicable interface alarm in question. The last field is the state of the error/alarm.

Performance Monitoring statistics for either the local or the remote TSU can be viewed on the DATAMATE or displayed on a CRT screen through the terminal interface for the SMART 16 shelf.

The parameters available in the performance monitoring reports are:

- %AV percent available seconds
- %EF percent error-free seconds
- ES errored seconds
- UAS unavailable seconds
- SES severely errored seconds
- BES bursty errored seconds
- LOFC loss of frame count

With the DATAMATE, statistics for the local TSU are viewed by selecting **RESET LOC PERF** in the Status menu (shown in Figure 4-14). Statistics for the remote TSU are viewed by selecting **RESET REM PERF** from this menu. A sample DATAMATE performance monitoring display is shown in Figure 4-16. The performance parameter plus the 15-minute and 24-hour totals for the selected parameter are shown on the second line of the display under their respective legends.

Other performance parameters are displayed by using the **Arrow** keys to cycle the display through the complete list of the available parameters.

The statistics for the local TSU can be cleared by selecting **RESET LOC PERF** from the menu shown in Figure 4-14, and the statistics for the remote TSU can be cleared by selecting item **RESET REM PERF** from this menu.

For the terminal interface, the performance monitoring menu for the local TSU is displayed by selecting **LOCAL PERFORMANCE** in the status menu shown in Figure 4-12 while the performance monitoring menu for the remote TSU is accessed by selecting item **REMOTE PERFORMANCE** from the menu.

The performance monitoring menu for the local TSU is shown in Figure 4-17. The only difference between this menu and the menu for the remote TSU is the first line of the display which denotes remote performance monitoring instead of local performance monitoring.

Both a performance summary and detailed report are available with the terminal interface. The performance summary report shows statistics for the current 15-minute interval, the 24-hour totals, the number of valid 15-minute intervals, and the seconds into the current 15-minute interval. A performance summary report is shown in Figure 4-18. The detailed report provides a 24-hour history of any one of the available parameters. One hour totals for the last 24-hours are displayed for the selected parameter as shown in Figure 4-19.

The remote performance statistics are available only when the network interface framing format is optioned for ESF.

ES 15/24 HR
10/20

Figure 4-16
DATAMATE Performance Monitoring Display Example

```
                    TSU LOCAL PERFORMANCE MONITORING

1 CLR LOCAL PERF.
2 PERFORMANCE SUMMARY
3 24 HOUR ES REPORT
4 24 HOUR UAS REPORT
5 24 HOUR SES REPORT
6 24 HOUR BES REPORT
7 24 HOUR LOFC REPORT
```

Figure 4-17
Display of Terminal Performance Monitoring Selection

```
                    TSU LOCAL PERFORMANCE SUMMARY

      VALID INTERVALS = 21
      CURRENT SECONDS = 334
      CURRENT %AV   = 0.3
              %EF   = 0.3
              ES    = 0
              UAS   = 333
              SES   = 0
              BES   = 0
              LOFC  = 0
      24 HOUR %AV   = 60.7
              %EF   = 60.5
              ES    = 42
              UAS   = 7426
              SES   = 39
              BES   = 3
              LOFC  = 8
```

Figure 4-18
Display of Terminal Performance Summary

```
                              TSU LOCAL ES
INTERVAL (HR)    TOTAL              INTERVAL (HR)    TOTAL
    1              0                    13             0
    2              0                    14             0
    3             10                    15             0
    4             32                    16             0
    5              0                    17             0
    6              0                    18             0
    7              0                    19             0
    8              0                    20             0
    9              0                    21             0
   10              0                    22             0
   11              0                    23             0
   12              0                    24             0
```

Figure 4-19
Terminal Detailed Report Example

Chapter 5
Specification Summary

SPECIFICATIONS AND FEATURES

The following list describes the TSU RM specifications and features.

Network Interface:	DS1 interface per AT&T 62411 and ANSI T1.403
Framing Format:	D4 (SF) or ESF
Line Code:	AMI or B8ZS
TX LBO:	Auto or Manual from 0.0 dB to -22.5 dB
Performance Monitoring:	As per ANSI T1.403 and AT&T 54016
DTE Interface:	V.35 synchronous
DTE Data Rates:	Nx56 or Nx64 kbps (N = 1 to 24)
Channel Allocation:	Alternate or Contiguous
Starting Channel:	Programmable
Timing Sources:	Network, Internal, or DTE master
Data Option:	Normal or Inverted data (Inverted HDLC)

Diagnostics:	1) Self Test 2) Local Loopbacks 3) Remote Loopbacks 4) Test Patterns
Power:	+5 V @ 350 mA -5 V @ 45 mA +12 V @ 15 mA -12 V @ 15 mA

Environment:

1) Temperature: Operating 0°C to 50°C (32°F to 122°F)
Storage -20°C to 70°C (-4°F to 158°F)

2) Relative Humidity: up to 95% non-condensing

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Product Support Information

Presales Inquiries and Applications Support
Please contact your local distributor, ADTRAN Applications Engineering, or ADTRAN Sales:

Applications Engineering	(800) 615-1176
Sales	(800) 827-0807

Post-Sale Support
Please contact your local distributor first. If your local distributor cannot help, please contact ADTRAN Technical Support and have the unit serial number available.

Technical Support	(888) 4ADTRAN

Repair and Return
If ADTRAN Technical Support determines that a repair is needed, Technical Support will coordinate with the Return Material Authorization (RMA) department to issue an RMA number. For information regarding equipment currently in house or possible fees associated with repair, contact RMA directly at the following number:

RMA Department	(205) 963-8722

Identify the RMA number clearly on the package (below address), and return to the following address:

ADTRAN, Inc.
RMA Department
901 Explorer Boulevard
Huntsville, Alabama 35806

RMA # _____